

No. 842,158.

PATENTED JAN. 29, 1907.

H. AAE.
LOCK.

APPLICATION FILED MAR. 29, 1905.

2 SHEETS—SHEET 1.

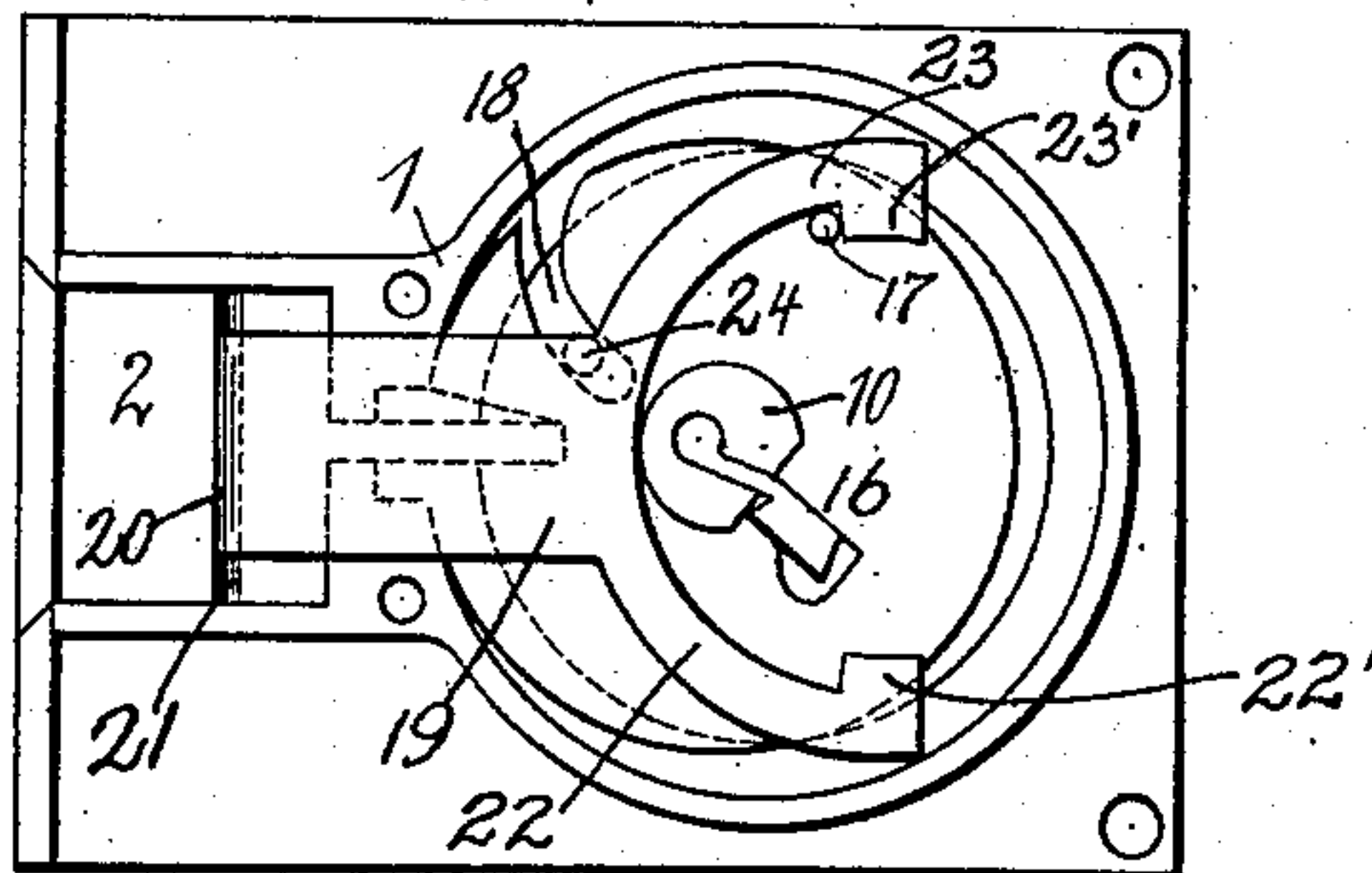


FIG. 1.

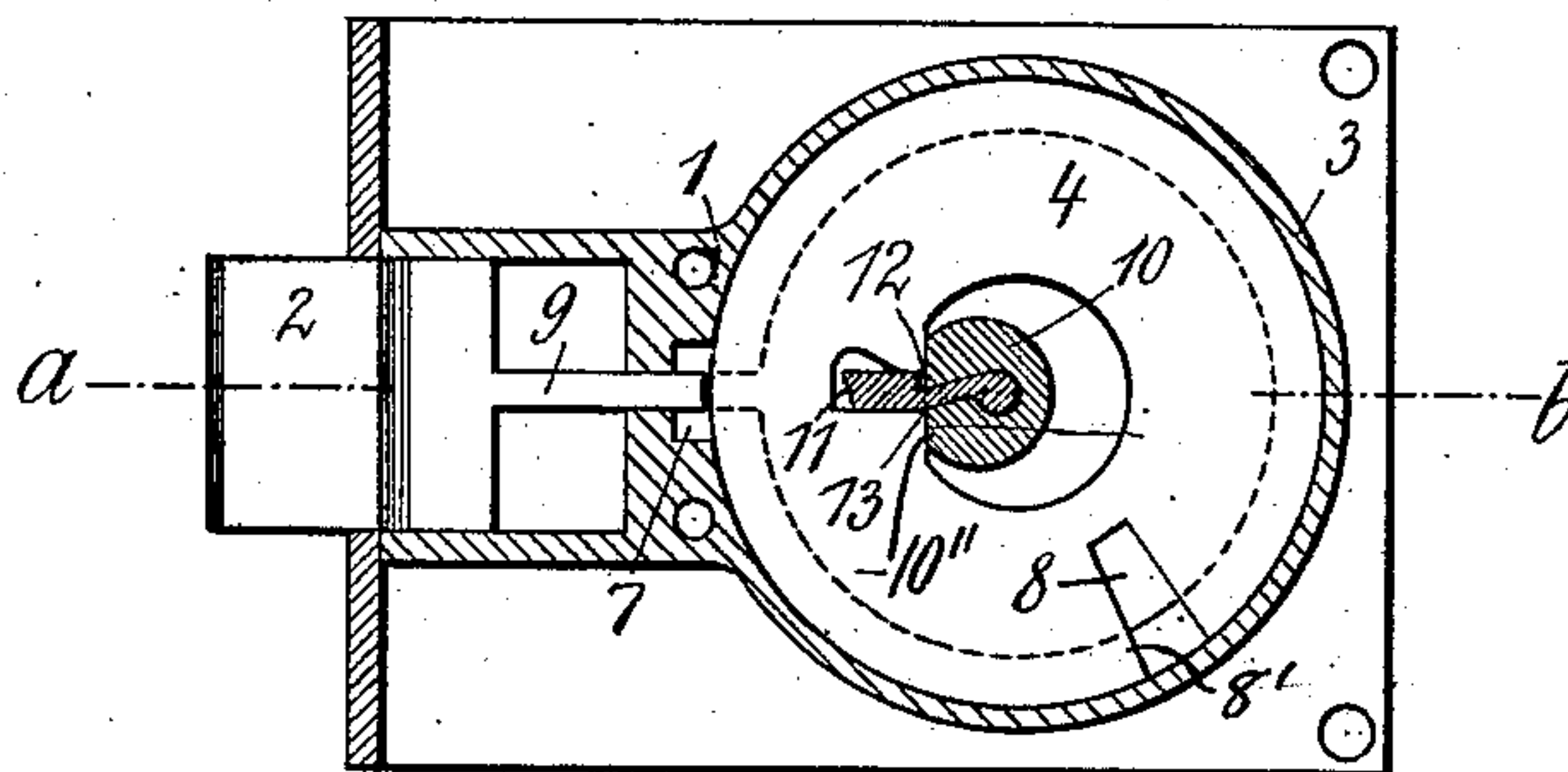


FIG. 2.

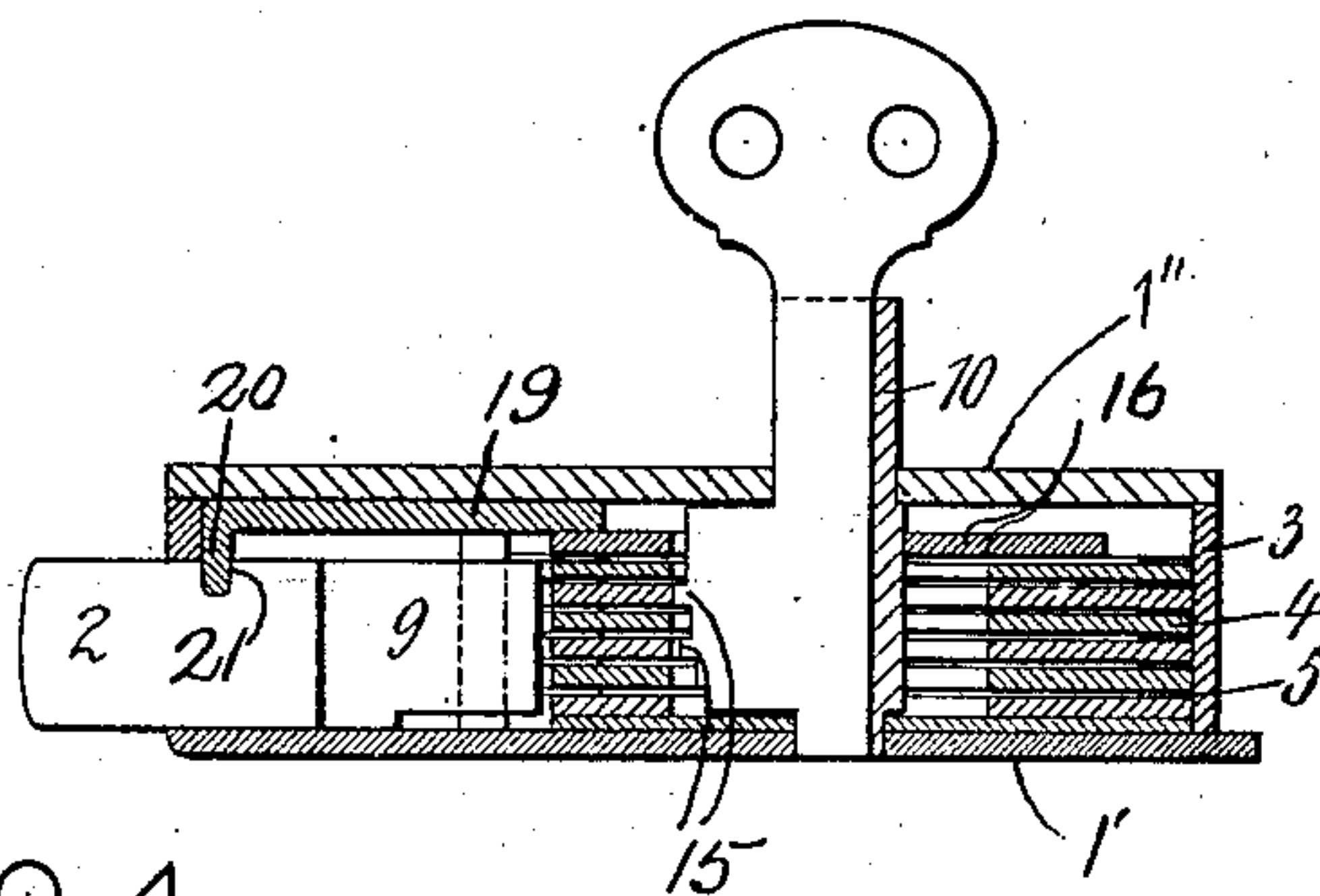


FIG. 3.

FIG. 4.

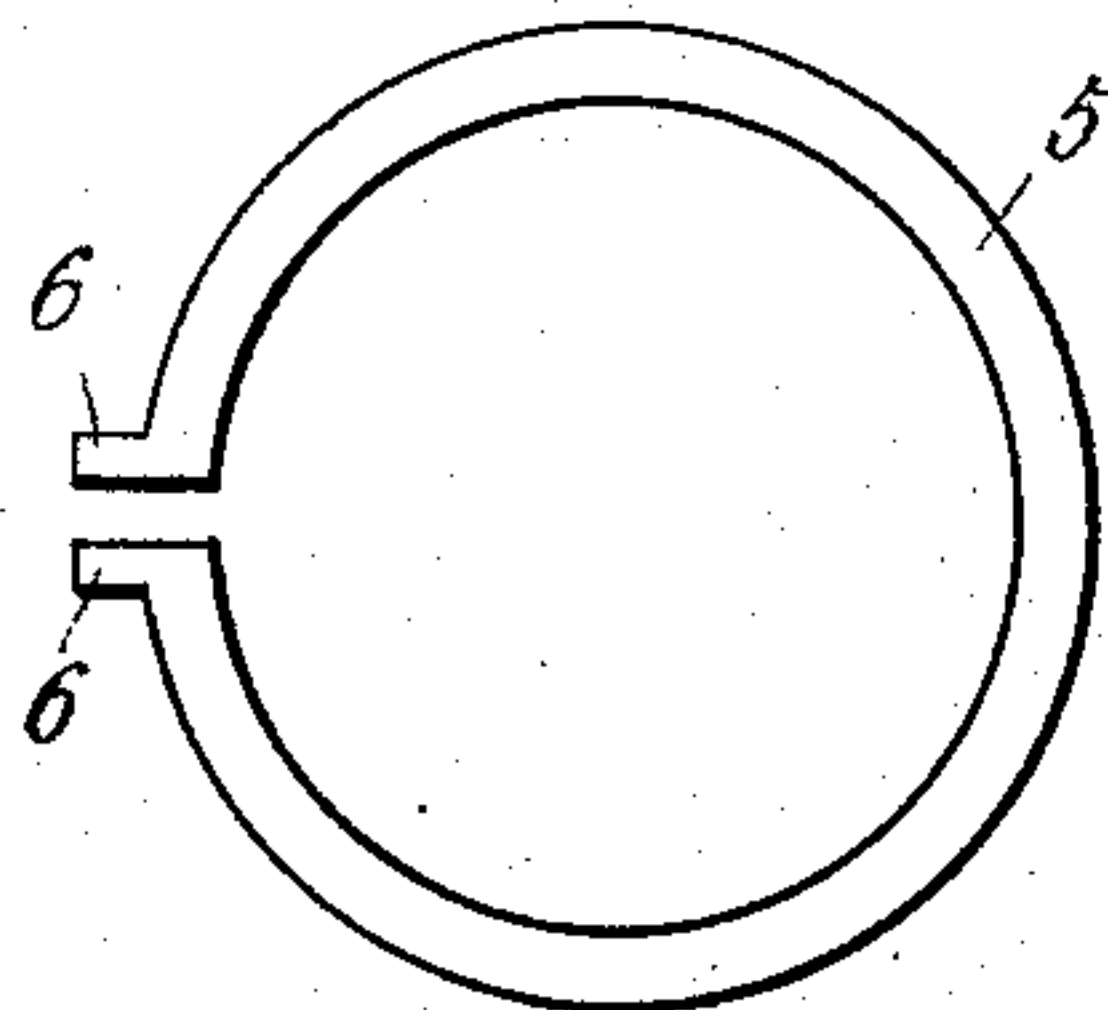
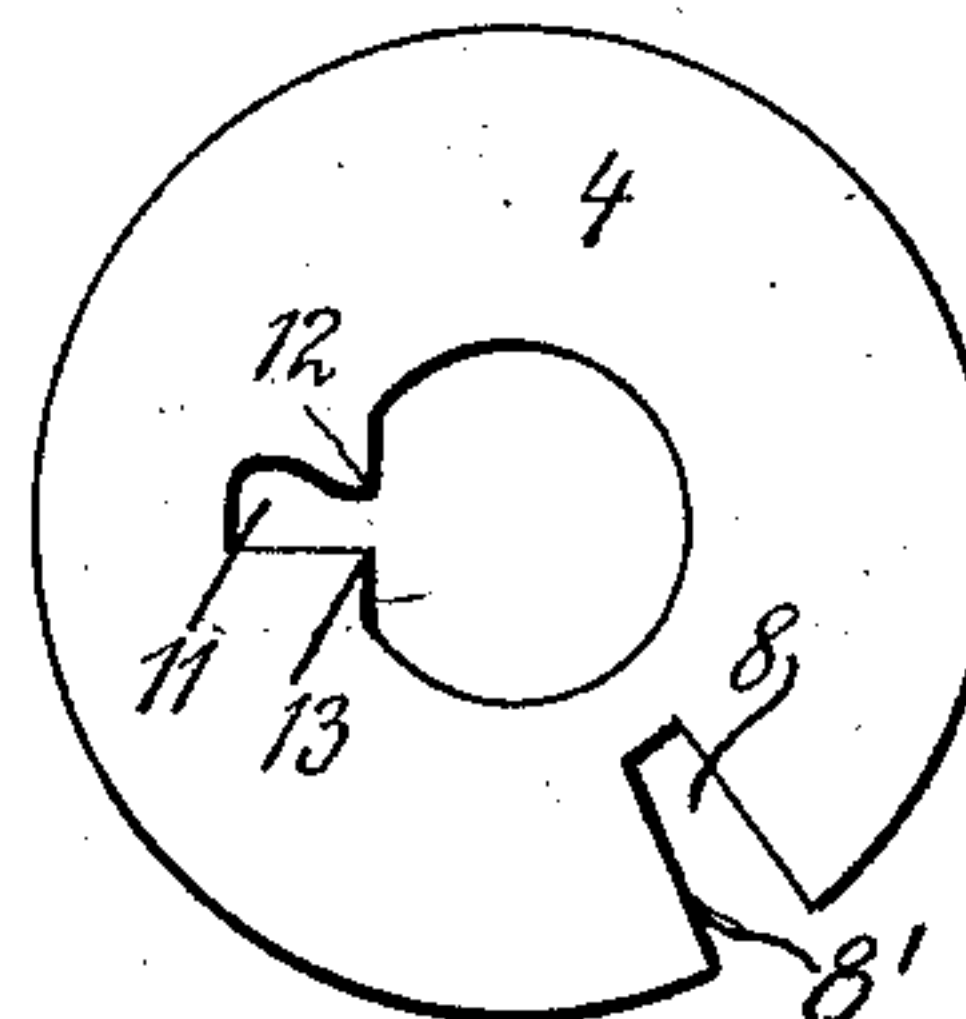


FIG. 5.



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2 SHEETS—SHEET 2.

FIG. 7.

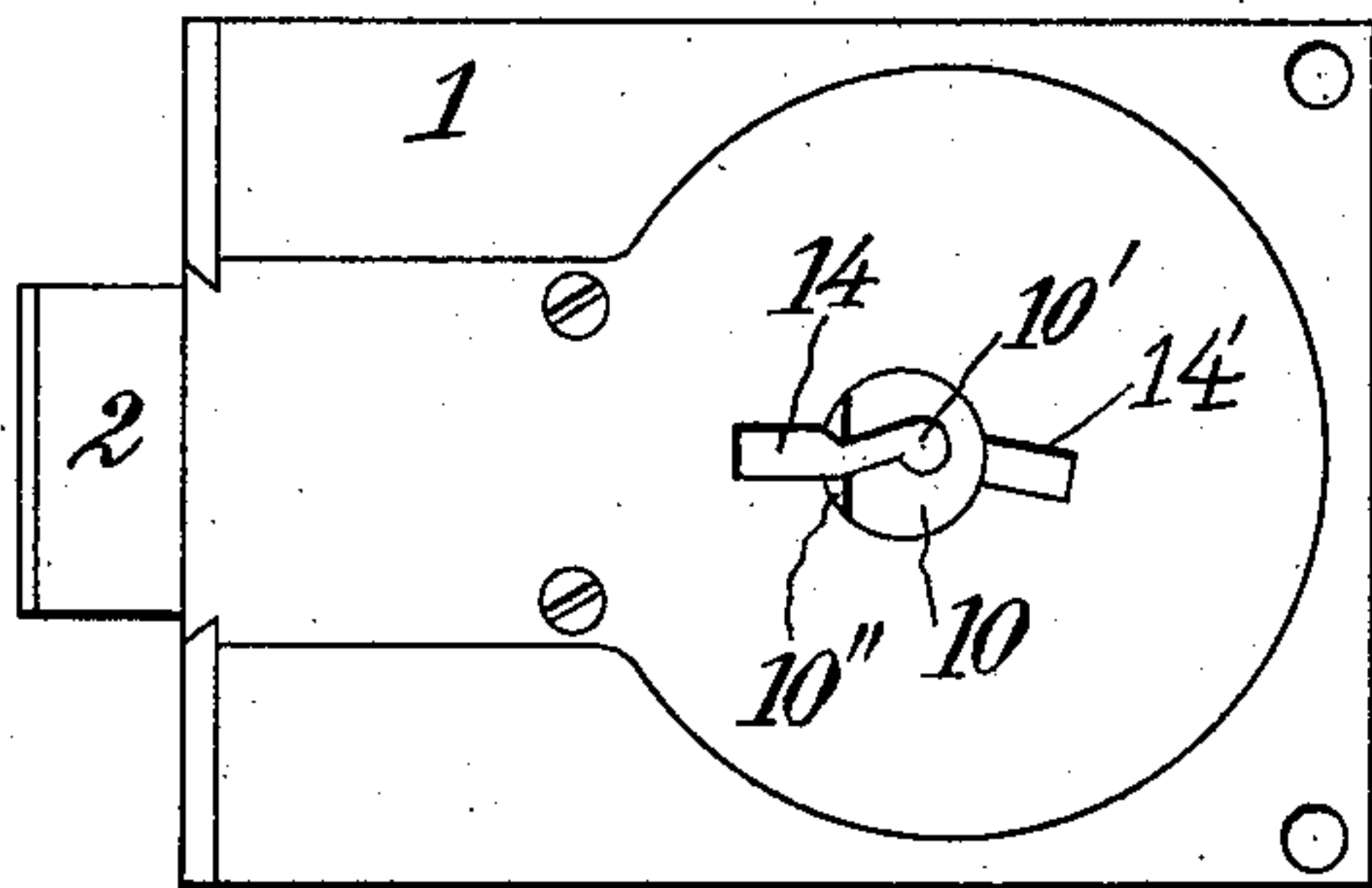


FIG. 8.

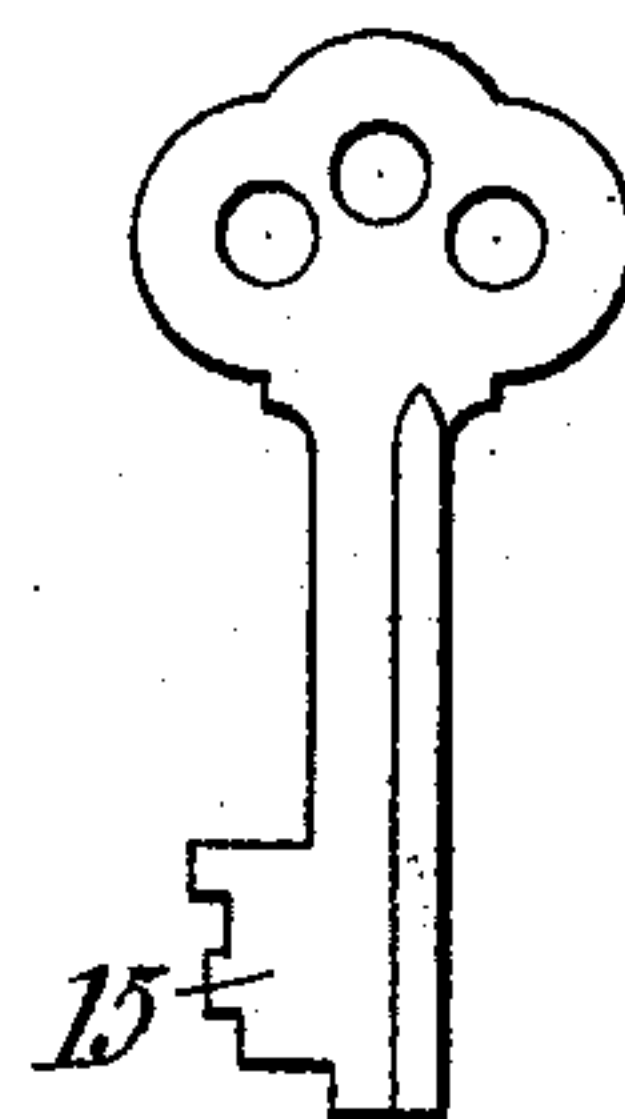
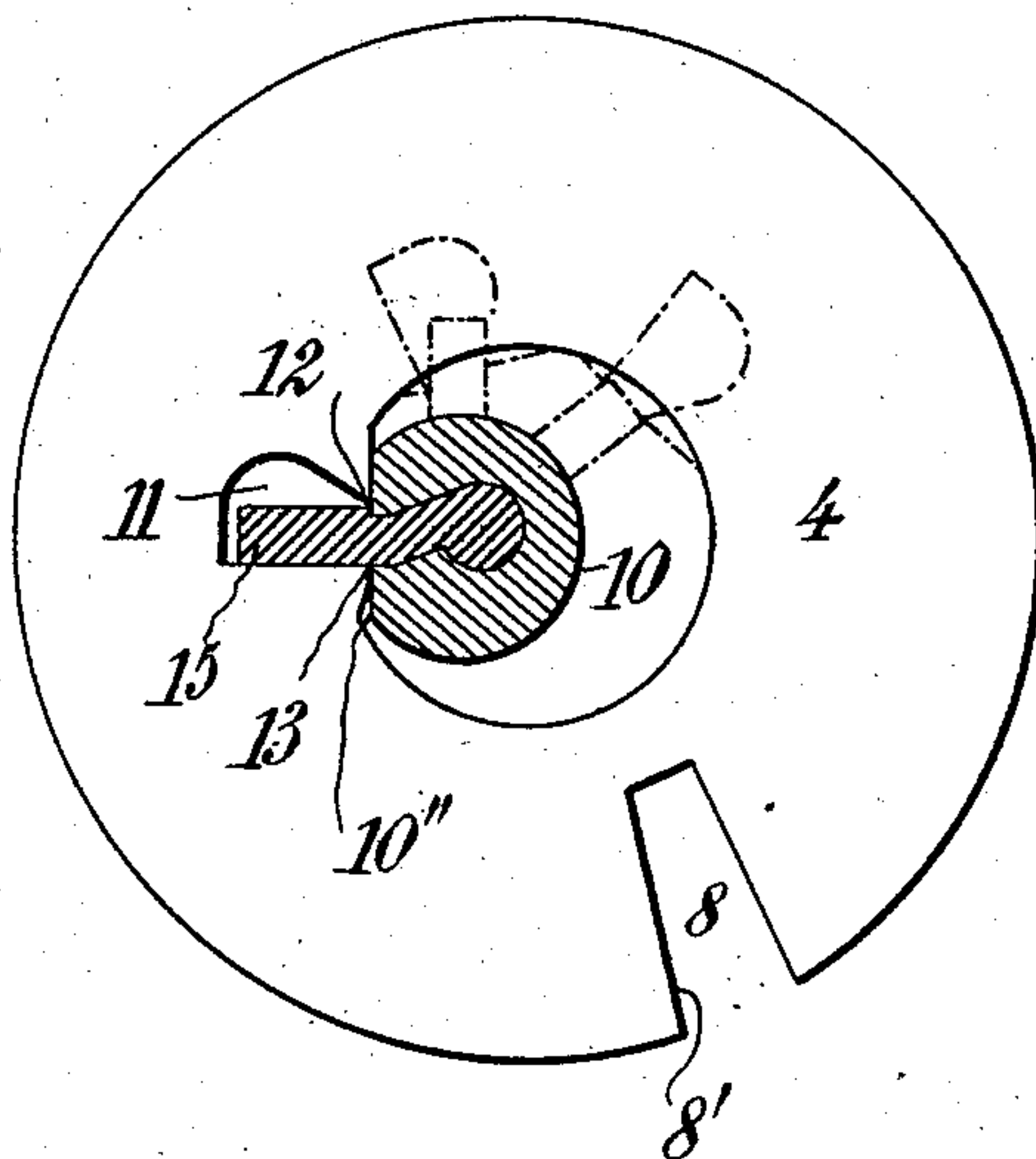


FIG. 6.



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UNITED STATES PATENT OFFICE.

HJALMAR AAE, OF AARHUS, DENMARK, ASSIGNOR TO AAES LAAS VERDENS-PATENT LIMITED, OF STRANDVEJ, DENMARK.

LOCK.

No. 842,158.

Specification of Letters Patent.

Patented Jan. 29, 1907.

Application filed March 29, 1905. Serial No. 252,751.

To all whom it may concern:

Be it known that I, HJALMAR AAE, town-council secretary, Dr. Jur., a subject of the King of Denmark, residing at Aarhus, Denmark, (whose postal address is Villa "Ma Folie," Strandvej, Aarhus, Denmark,) have invented new and useful Improvements in Locks, of which the following is a specification.

10 This invention consists in a non-pickable lock having substantially annular tumblers mounted eccentrically to and encircling the key-axis and which can be turned into certain positions that will allow the bolt to be
15 drawn in, but are when the bolt is in its outer position and the device is to be locked successively removed and adjusted into their registering positions and left in such positions, each tumbler being turned by direct
20 action of the key-bit entirely without use of controlling-springs and being disengaged from and reengaged to the same at its proper point.

25 Another point of the invention is the provision of a plug which acts to hold the rotary tumblers in a locked position relatively to each other when the device is locked and the key withdrawn.

30 A still further feature is the provision of means for exactly registering the tumblers in the positions in which they are to be reengaged by the key-bit when the device is to be locked.

35 The accompanying drawings show, by way of example, a lock constructed according to this invention and embodying its principles.

40 Figure 1 is a front view of the lock with its bolt drawn back and its cover removed. Fig. 2 is the same view of the lock, except that the bolt is in its outer position and that some parts are removed. Fig. 3 is a longitudinal section on the line *a b* in Fig. 2. Figs. 4 and 5 are views of details. Fig. 6 is an enlarged view of one of the tumblers and the
45 key and key-plug, the latter being shown in several positions in dotted lines. Fig. 7 is a front view of the lock with its bolt pushed out. Fig. 8 is an elevation of the key.

50 Referring to the drawings, 1 is a case inclosing the lock and having an aperture in its side, into which is fitted a sliding bolt 2. Behind the bolt and in a hollow of the cylinder 3 are placed a number (in the drawings

six) of accurately-shaped annular tumblers 4 of circular form, one of which is shown in 55 Fig. 5. They fit exactly into the cylinder 3, so that they may without play be turned around their axis. Alternating with these tumblers are inserted thin annular disks or rings 5, each having two projections 6 in 60 their own plane, which engage into a groove 7 on the inside of cylinder 3, so that they cannot revolve. They serve to prevent the tumblers 4 from actuating each other while being turned. One of these rings is shown in 65 Fig. 4. Each of the tumblers 4 has an external notch 8. When the lock is being opened, all of these notches stand right before the tail 9 of the bolt at the moment when this is going to be drawn in. In this position 70 the notches therefore allow the bolt-tail to pass freely into the tumblers; but in any other position the tumblers will prevent the bolt from being drawn back.

75 A plug 10 is fitted between the bottom 1' and the cover 1'' of the case 1 and guided in these in such a manner that it can be turned around its axis. It has a longitudinal slit 10' of a shape that fits the key, so that when the latter is turned its axis of revolution is 80 coincident with that of the plug. Each of the tumblers 4 has on its inner surface a radial slot 11, the corners of which are marked "12" and "13." When the lock is locked, the tumblers will have their slots 11 opposite 85 the keyhole 14 facing the bolt, and the key-bit 15 when inserted in the lock will fit into all the slots 11. Turning the key to the right will then cause the tumblers 4 to revolve in the same direction; but inasmuch as 90 the plug 10 is not concentric with the tumblers the key-bit 15 will at a certain point, depending on the length of the bit, get out of engagement with the slot 11 and leave the tumbler there at a standstill during the further 95 revolution of the key. The length of the key-bit 15 is preferably different for each of the tumblers, and to every length of bit corresponds a certain angle of revolution before the key-bit leaves the slot 11 and the 100 tumbler stops. This angle increases as the length of bit is increased.

The notches 8 of the different tumblers 4 are placed differently in relation to their corresponding slots 11, and the angular distance 105 between the notch 8 and the slot 11 of any

tumbler is so arranged that the notch will always be in front of the bolt-tail 9 at the moment when the key-bit 15 leaves the corresponding slot 11. When the key-bit has
 5 left all the tumblers 4, then each of these will stay in a position allowing the bolt to be drawn back.

To the plug 10 is fastened a disk 16 with the curved incision 18 and from which projects a pin 17. On top of the disk 16 is placed
 10 a bar 19, of which the fore end 20 is turned down and engages into a corresponding groove 21 in the upper side of the bolt 2, so that the movement of the latter is bound to
 15 follow that of the fork. The rear end of the bar 19 is bifurcated, forming the prongs 22 and 23, either one of which terminates in a hook 22' and 23', respectively, and from the under side of the bar 19 projects a pin 24,
 20 engaging, during the inward or outward motion of the bolt 2, the incision 18, but resting when the bolt is out against or close to the edge of disk 16.

The mechanism acts in the following manner: When the bolt 2 is pushed out and is going to be drawn in, then the key is inserted in the plug 10, the key-bit 15 passing through the keyhole 14 and engaging all the incisions 11 of the tumblers, as shown in Fig. 3. If
 30 now the key is turned toward the right, its bit will revolve all the tumblers 4; but on account of the eccentricity of the key-axis in relation to the axis of the tumblers the bit 15 will disengage the tumblers one after another, and thus leave them behind at a standstill in their various positions corresponding thereto. At the same time the plug 10 will cause the disk 16 to follow its rotation, and during this motion its projecting pin 17, resting, to begin with, against the hook 22' of the
 40 prong 22, will now revolve freely inside of the prongs 22 and 23 of the bifurcated end of the bar 19. At the moment when the last tumbler is disengaged from the key all the tumblers will have their incisions 8 right in front of the bolt-tail 9, and the pin 17 of the disk 16 will have nearly reached the hook 23' of the draw-bar 19, while the incision 18 of the disk 16 will be nearly in front of the pin 24 on
 50 said bar. On the key being turned a little farther the pin 17 will hit the hook 23', and the incision 18 will be in front of the pin 24, and on still further revolution of the key the pin 17 will draw the bar 19, and consequently
 55 also the bolt 2, into the lock, the bolt-tail 9 entering into the tumbler-incisions 8 and simultaneously the pin 24 into the disk-incision 18 until the motion is stopped by the bolt 2 reaching the bottom of its slot in the case 1.
 60 The lock is then opened, and the key may be withdrawn through another keyhole 14' in the cover 1". If then the bolt is to be pushed out again, the key must be turned in left-hand direction, causing first the convex edge
 65 of the incision 18 of the disk 16 to push to-

ward the left the pin 24 of the bar 19, and subsequently the bolt 2 out of the lock-case, the pin 17 in the meanwhile rotating freely backward inside of the prongs 23 and 22. During the further revolution of the key its
 70 bit will now reengage one after another of the incisions 11 of the tumblers, getting freely past their corners 12, but taking hold of their corners 13, the latter ones being on account of the eccentric arrangement nearer to the
 75 key-axis than the former ones. The tumblers are thus bound to follow back with the key into the position they occupy in Fig. 2, and at the very moment they reach this position the pin 17 hits the hook 22' on the bar
 80 19, thus preventing any further motion of the key, and consequently of the mechanism at large. The tumbler-incisions 8 are thus revolved through different angles away from the bolt-tail 9, and the bolt is hereby locked
 85 in its outer position, whereafter the key may be withdrawn through the keyhole 14.

The one edge 8' of the notches 8 is inclined against the radius of the tumbler, so that the corresponding corner of the bolt-tail 9 in being retracted gives all of the tumblers a slight
 90 turn beyond the position previously given them by direct action of the key-bit. This adjustment of the position of the tumblers is provided in order to make sure that the key-bit may freely pass the foremost corners 12 of
 95 all the slots when next time the lock is being locked. This special provision would seem at first sight to be superfluous, because at the last opening of the lock the key has turned
 100 each tumbler just so far that its bit might freely pass the said corner 12. In fact, the only reason for making this arrangement is to counteract the effect of possible slight inaccuracies of workmanship in the lock.
 105

The key-plug 10, as shown, may have at the point where it touches the inner edge of the tumbler a flat face 10" and the tumbler edge a corresponding projection. This arrangement may be provided in order to
 110 hold the tumblers in a locked position relatively to each other when the key is withdrawn, so that they cannot be turned separately one after another by means of skeleton keys, being bound to follow each other in the
 115 beginning of their movement as long as their flat portions are in contact with that of the key-plug; nor is it possible to turn the plug alone without at the same time turning the
 120 tumblers by direct action on their incisions 11; but even if it might be possible by some artifice to effect the proper revolution of each individual tumbler—i. e., to bring the incision 8 of each at rest in front of the
 125 bolt-tail 9—it would not be possible, for instance, by means of a chisel to force the bolt 2 back into the lock. The pin 24 on the bar 19, connected with the bolt 2, would prevent this, as it would be stopped by the edge
 130 of the disk 16. This disk must evidently be

turned into proper position before the bolt 2 may be forced into the lock even if all tumblers occupy the position where they allow the bolt-tail 9 to enter. For the cylinder-plug 10 a fixed guide-pin may be substituted, which projects from the bottom of the lock-case and engages a central bore in the key-shank, or the key may be guided in holes in the bottom plate and the cover-plate of the lock-case. By varying the angle between the notches 8 and the slots 11, as well as by combining the resulting different tumblers, the number of distinctly different locks may be made as great as desired.

The essential features of this lock are the annular tumblers with their large movement and the circumstance that no springs are provided to bring the tumblers into their extreme position, which is usually the case. In the lock described the tumblers are brought into the correct locking position by direct action of the key-bit, so that there is no necessity for relying on springs. From the arrangement used for revolving the tumblers it follows that even a slight inaccuracy in the key will cause a very large error in the adjustment of the tumblers, so that an inaccurate key will not be able to open the lock.

It will be obvious that the principle underlying this invention may also be applied to clasp-locks, padlocks, and generally any other kind of locks than the one shown on the drawings by way of example.

It will be understood that I do not wish to be limited to the construction shown, since many changes may be made therein without departing from the invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a lock, a series of rotatable annular tumblers adapted to be rotated to varying extents from an unlocking to a locking position, and each of said tumblers having means adapted to engage a key during its unlocking movement, and to disengage it when such tumbler reaches the unlocking position, and having means adapted to engage the key during its locking movement, and to disengage it at the completion thereof.

2. In a lock, a series of annular tumblers adapted to be rotated about a fixed axis to bring them into and out of their registering positions, such tumblers being adapted to be turned by the key both from their unlocking to their locking positions, and from their locking to their unlocking positions, and each tumbler being adapted to be disengaged from the key when turned thereby to a predetermined extent during the unlocking movement.

3. In a lock, a series of annular tumblers, each formed with a recess the sides of which are engaged by the key during its locking and unlocking movements, such tumblers being rotated by the key to varying extents to bring

them to registering position, and being reversely rotated by the key to bring them to locking positions.

4. In a lock, a series of annular tumblers mounted to rotate about a common fixed axis, and adapted to be rotated in the same direction as the key during the unlocking movement of the latter and by such rotation to be brought to a common registering position, such tumblers being successively disengaged as they reach such position.

5. In a lock, a series of annular tumblers mounted to rotate about a common fixed axis, and adapted to be rotated in the same direction as the key during the unlocking movement of the latter and by such rotation to be brought to a common registering position, such tumblers being successively disengaged as they reach such position, such tumblers being adapted to be reengaged by the key during its locking movement, and moved by the key to their locked position, such reengagement of such tumblers being in inverse order of their disengagement.

6. In a lock, a series of rotary tumblers of substantially annular shape, each having means for coacting with a bolt, and means for engaging a key during its unlocking movement, said engaging means and said coacting means being differently spaced in the several tumblers, and said tumblers being mounted eccentrically to the key, so that they are disengaged from the latter at different positions, and said tumblers each having means for engaging the key during its locking movement, whereby the tumblers are returned to their locked position by the key.

7. The combination with a key having bits of different degrees of extension, of a lock having a series of annular tumblers mounted to rotate around the key eccentrically to the latter, said tumblers having slots engaged by said key-bits, and being rotated by the latter to varying extents in accordance with the lengths of said bits, said key engaging said tumblers and moving them both into and out of registering positions, and a series of annular disks interposed between said tumblers.

8. In a lock, a series of tumblers adapted to be moved to different extents by the key and to be disengaged therefrom in registering positions, said tumblers being adapted to remain in their registering positions until engaged directly by the key and moved therefrom.

9. In a lock, a series of tumblers adapted to be moved to different extents by the key and to be disengaged therefrom in registering positions, and means for locking said tumblers in their locking positions, said means comprising a key-plug adapted to rotate into engagement with said tumblers.

10. In a lock, a bolt, a series of rotary tumblers of substantially annular shape, each having a slot adapted to coact with the bolt,

said slots having a side which forms an angle with a radius of the tumbler, and said bolt being adapted to coact with such side to turn the tumbler beyond the position to which it is moved by the key.

11. A lock having annular tumblers 4, eccentrically encircling the key, and each having a slot 11, with corners 12 and 13, of which the latter 13 may be nearer to the key-axis than the former 12, and serves to catch the key-bit during its motion toward the locked

position, while the former corner 12 serves to adjust the tumblers, so as to allow the bolt to be retracted.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HJALMAR AAE.

Witnesses:

S. RASINURTER,
VILL SPANGE.